



INSTAPAK
CORPORATION

technical data sheet

DPM 6060

TECHNICAL INFORMATION

INSTAPAK S-1

SYSTEM FOR FOAMING-IN-PLACE

GENERAL INFORMATION

The INSTAPAK Foam-in-Place Packaging System represents a combination of unique chemistry and equipment. This combination delivers a very low density polyurethane foam which expands and cures in 20 seconds to a semi-rigid foam having ideal mechanical properties for the protection and securing of industrial products. The foam has a density of only $\frac{1}{2}$ pound per cubic foot (0.5 PCF) as compared with typical plastics foams and other loose-fill materials of several times this density.

Instapak has developed a wide variety of techniques for using the foam-in-place concept to encapsulate, brace or otherwise accommodate a wide spectrum of products. Instapak Representatives are prepared to demonstrate these techniques.

This information bulletin is intended to include such technical information about the chemicals and foam of the INSTAPAK system as may be of interest to a user.

THE FOAM

The INSTAPAK S-1 foam can be described as follows:

CHEMICAL COMPONENTS

Component A (Red)
Component B (Blue)

Polymeric Isocyanate
Polyurethane Resin

FLASH POINTS OF COMPONENTS

A
B (Non-flammable)
Cream Time
Rise Time
Tack Free Time
Degree of liquid expansion

$415 \pm 20^{\circ}\text{F}$
Indeterminant
Less than 5 seconds
 20 ± 5 seconds
 20 ± 5 seconds
Over 100 times

FOAM

Density, lbs/cuft	0.47 - 0.59
Compressive Strength	2.3 + 0.5 lb/in ²
Recover, 50% Compression	90 + 5%

INDUSTRIAL HYGIENE

Product Data Sheets are available on the individual chemical components of the Instapak S-1 foam. These give detailed chemical and physical properties. The two components of the system are quite different in their basic nature. The "B" component is a chemical formulation of relatively inert, unreactive character. The "A" component is a chemical which will react with other substances too (like water) and should be handled accordingly.

Component "A" is "active" in that it is designed to react with the "B", or resin, component to form urethane. This active nature of the "A" component also makes it susceptible to reacting with substances other than the "B" component. For example, it will react with water, even the moisture content of the air to form an unwanted plastic material. If it reacts with something like water, it loses its "active" quality and solidifies. Being deactivated, it will no longer produce urethane foam with the resin. Containers need to be kept tightly closed so as to not expose the "A" component to humid air.

If one accidentally were to spill "A" component on the skin, it may react somewhat with the moist surface but the reaction is not rapid nor violent and such as accidental exposure can be removed by washing thoroughly with soap and water..

If one were to get "A" component into the eyes, this very moist area might cause more irritation than on the skin and after thoroughly washing out the eye it is wise to check with a physician to be sure the cleaning has been effective and complete.

The mucuous membrane of the nose, mouth and respiratory tract also represents areas where there is moisture that "A" component could react with. A special attribute of the "A" component (polymeric isocyanate) is that it is a viscous, high boiling, non-volatile material. The vapor pressure is so low that use of the material in making urethane foam does not create an atmosphere of vapors that pose any health problem. This fact, being important to establish conclusively, has been confirmed by repeated independent testing. In addition to Instapak having sponsored tests to quantify this question, Instapak Customers, the U.S. Air Force and others have run tests to confirm the absence of any vapor problem.

In one specific instance, for example, a government laboratory field inspector performed a test of the work atmosphere by attaching the test device to the body of a packaging operator while this operator engaged in the Instapak foaming-in-place process. This actual work atmosphere proved to have no vapor problem.

The Threshold Limit Value (TLV) for isocyanate vapors as set by OSHA is 0.02 PPM. All tests performed on the Instapak system show this value virtually cannot be exceeded in an operator's breathing zone (due to the low vapor pressure of the "A" component) and, in fact, is typically in the work area at a very, very low level of substantially less than 0.005 ppm. Detailed reports giving all the actual test data from numerous studies are available from Instapak.

The "B" component of the Instapak S-1 foam is a chemically unreactive material (except with very special chemicals like the isocyanate). It is not classified as hazardous and presents no problems in use. If one repeatedly exposed the skin to "B" component, it might prove to be irritating but, ordinarily, the results of a spill on the skin is totally negated by washing with soap and water. If one were to accidentally get this component in the eye it probably would be irritating and after thorough washing one would be wise to have the eye checked by a physician.

The chemical blowing agent in the "B" component is volatile and if the "B" component is warmer than room temperature some of this ingredient will evaporate. The TLV established for this ingredient is quite high, 1000 ppm, and there is little likelihood that one would be exposed to such a concentration.

Operators occasionally notice, in making the Instapak S-1 foam, that the odor of the catalyst ingredient in the "B" component is noticeable during foaming. This somewhat "fishy" odor might be disagreeable to some operators. It should not be construed as being a health problem in that the ingredient is not a hazardous substance but a very low concentration has a detectable odor. The operators objection can be removed if the packaging area is simply well ventilated. Proper location of a circulating fan, for example, will dilute the odor effect satisfactorily.

THE FOAMING REACTION

Although the properties of the individual chemical components of the Instapak S-1 foam, are of interest to users, and would be necessary information in the unusual event of spilling materials or such an unexpected occurrence, in normal operation a user is, in fact, never directly exposed to these components.

The urethane reaction in the Instapak system is so rapid that although it is chemical components traveling through the chemical lines, the stream coming out of the Instapak gun is already a reaction product of the two components, as such, dispensed by the system and therefore essentially no isocyanate vapor pressure.

The foaming reaction is very rapid. The chemical stream begins to foam within about one second of emerging from the dispensing gun nozzle. The foam expands to its full volume within about 20 to 30 seconds and is "tack free" (not sticky) about at the end of its full rise. This rapid foam formulation is achieved with a catalyst in the system which promotes the reaction and produces some internal heat that cures the foam almost simultaneous with its formation.

Within the body of a piece of foam as it is forming, the temperature rises to somewhat above boiling water and part of the blowing process causes a brief puff of water vapor at the end of the rise. This vapor condenses rapidly and has been shown to have no effect on products being packaged. A package reaches equilibrium with the atmosphere in a short time and initial vapors in a package are lost to the surroundings. As long as the outer material of a total package is a breathable material, e.g. Kraft paper corrugated carton, no problems of incompatibility between Instapak foam and products has occurred. The Instapak system has been widely proved to not cause any problems in packaging such a wide range of products as electronic gear, telephone equipment, metal products of steel, brass, aluminum, copper or magnesium, scientific instruments, office machines, lamps, wall decor, auto and aircraft parts, pumps, motors and gears.

Although the internal temperature of a "bun" of foam, as it is foaming, is moderately high, the outside surface of the foam is only warm. In no event does the temperature of the foam cause the article being packaged to warm to a temperature any higher than it will typically experience in transportation in normal modes. The nature of the foaming process automatically, simultaneously dries and cools the surface of the foam as it is forming.

STORAGE AND DISPOSABILITY

Consideration has been given to the various aspects of using Instapak foam from both a product storage and the ultimate disposal of the foam and appropriate studies and tests have been conducted to clarify questions.

Instapak foam, like any packaging material of an organic nature (paper, polystyrene foam, polyethylene foam, corrugated inserts, wood excelsior, etc.) will burn in a fire. The nature of its burning, however, is so different in character from such a material as polystyrene foam as to be the difference between a controllable fire and a holocaust.

At one time consideration was being given to the merits or disadvantages of adding fire retardants to the Instapak polyurethane system. Instapak foam, like most plastics, can be rendered "flame retardant" or "self-extinguishing". No ordinary plastic material can practically be made non-flammable and, in the final analysis it usually develops that non-flammability, rather than flame retardancy would be the ideal desire.

Since any organic packaging material, whether it is flame retarded or not, is going to burn in the event of a fire, the real question becomes one of considering how the material will burn. Instapak foam burns cleanly and a fire can be controlled by usual, known methods of fire fighting. In contrast, plastics with the usual flame retardants burn with the evolution of corrosive, toxic gases and foams like polystyrene burn in a fashion to produce "runaway" fires under normal conditions.

Taking these facts into consideration along with recognizing that all packaging materials must ultimately be disposed of into the environment, it has become a consensus that the addition of flame retardant additive chemicals to Instapak foam would be an undesirable adulteration.

In reference to burning tests, two reports are available from Instapak which provide test data regarding the disposability of Instapak foam by burning. One report shows the gases generated by the burning of Instapak foam and the other report shows, for comparison, the composition of flue gases that are produced in burning trash and trash with low levels of rigid (insulation) polyurethane foam. The comparisons show that rigid polyurethane, closed-cell insulation foam does, to a significant degree, add pollutants to the flue gases from burning trash. In contrast, the addition of Instapak foam to trash would not cause any significant increase in the level of toxicants in the flue gas. As a matter of fact the Instapak foam alone burns more cleanly than an ordinary trash composition.

Another burning test was conducted in which product facsimilies were packaged respectively in paper, in polystyrene foam and in Instapak foam. Stacks of cartons of each of these cases were compiled similar to standard warehouse procedure and these stacks were burned in an area equipped with an automatic sprinkler system. In the cases of both the paper and the Instapak foam, the fire was controlled by the sprinkler system whereas with the polystyrene foam the fire went out of control. Details of this test, which demonstrated that the Instapak foam burned in a manner comparable to a Class Commodity three (3) packaging material (materials whose storage is considered non-hazardous with standard fire prevention procedures) are available in the form of a complete report.

The alternative to disposing of Instapak foam along with other trash by incineration is to bury it. Instapak foam is bio-stable and does not produce any degradation products when buried that would give rise to questions about polluting the environment. If Instapak foam is not buried and left exposed to sunlight it undergoes photolytic degradation and gradually crumbles to a powder.

Unused A or B chemical can be disposed of as regular trash as long as any Federal, State or Local regulations regarding environmental control are taken into consideration. The chemicals themselves can be incinerated with other trash or disposed of through a waste treatment facility.

Empty containers, with some chemical residue, should be open to the atmosphere when disposed of - discard container plugs to exclude the possibility of chemical or heat pressure being produced. Containers, either crushed or not, can be used for land-fill. Any chemical residue will biodegrade to the equivalent of such degradation products as result from waste biodegradable detergents.

INSTAPAK GUN SOLVENT

The solvent used in the Instapak gun chamber is a unique industrial solvent. No substitute has been found effective and trouble usually results from attempts to use other solvents. This solvent is not a hazardous chemical and although it will burn its flammability is relatively low (flash point 120 F, autoignition temperature 460 F). Ordinary good housekeeping practices are sufficient to prevent any handling problems.

For detailed technical reports or information contact:

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